

# PATENT ABSTRACTS OF JAPAN

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(71)Applicant : SEIKO EPSON CORP

(22)Date of filing : 28.12.1998

(72)Inventor : UCHIYAMA KENJI

(30)Priority

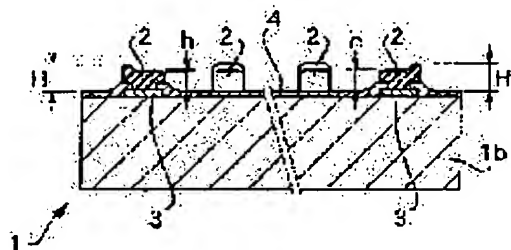
Priority number : 10 93682    Priority date : 06.04.1998    Priority country : JP

(54) IC CHIP, IC STRUCTURE, LIQUID CRYSTAL DEVICE AND ELECTRONIC UNIT

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent conduction particles contained in ACF from escaping from the bump faces of an IC chip and to permit a larger number of conduction particles to exist on the bump faces, at the time of making the IC chip provided with a plurality of bumps adhere to a substrate by ACF (anisotropic conductive film).

SOLUTION: An IC chip 1 which incorporates a semiconductor, has a plurality of bumps 2 exposed to outside and whose face provided with the bumps 2 is adhered to a substrate by ACF is installed. The height H of an outer part on at least one of a plurality of bumps 2 is set to be higher than the height (h) of an inner part. At the time of pressurizing ACF by the IC chip 1, conduction particles contained in ACF are prevented from escaping to the outer side of the bumps 2 by the outer part whose height is higher, and much more conduction particles are acquired by the bumps 2.



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**LEGAL STATUS**

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**CLAIMS**

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[Claim(s)]

[Claim 1] the front face of a component side where it counter with said member for adhesion of said bump in IC chip with which the field which be equipped with two or more bumps who expose outside while build in the semi-conductor , and be equipped with those bumps be stick to the member for adhesion by pressure by anisotropy electric conduction adhesives be an IC chip characterize by the height of the direction of an outside of the IC chip concerned be higher than the height of the direction of the inside .

[Claim 2] It is IC chip characterized by being smaller than the path of the electric conduction particle by which the difference dimension (H-h) of height is contained in said anisotropy electric conduction adhesives when setting the height of said bump's lateral part to H and setting the height of the bump's inside part to h in IC chip according to claim 1.

[Claim 3] It is IC chip characterized by having a crevice in the component side which said bump counters with said member for adhesion in IC chip according to claim 1 or 2.

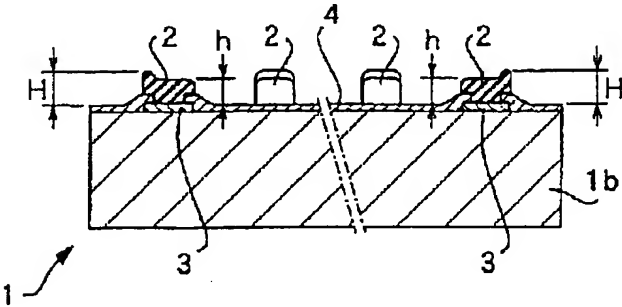
[Claim 4] It is IC structure to which said IC chip is characterized by the thing of claim 1 to the claims 3 constituted [ any / one ] by IC chip of a publication at least in IC structure which has IC chip and the substrate which the IC chip pastes up using anisotropy electric conduction adhesives.

[Claim 5] It is liquid crystal equipment with which the IC for a liquid crystal drive is characterized by the thing of claim 1 to the claims 3 constituted [ any / one ] by IC chip of a publication at least in the liquid crystal equipment which has a liquid crystal panel including the structure which sandwiched liquid crystal with the substrate of a pair, and IC for a liquid crystal drive connected to the liquid crystal panel directly or indirectly using anisotropy electric conduction adhesives.

[Claim 6]

Drawing selection **Representative drawing** ☒

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DETAILED DESCRIPTION

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## [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to IC chip of the structure which forms an input/output terminal by two or more bumps. Moreover, this invention relates to IC structure constituted including the IC chip. Moreover, this invention relates to the liquid crystal equipment constituted including the IC chip. Moreover, this invention relates to the electronic equipment constituted including the IC chip.

[0002]

[Description of the Prior Art] Liquid crystal equipment is widely used as current, a portable telephone, a video camera, and other visible image displays of various kinds of electronic equipment. Moreover, various kinds of semiconductor devices are equipped in such electronic equipment or liquid crystal equipment. This semiconductor device is things, such as the IC chip itself and IC structure with which IC chip and the substrate are united.

[0003] As the above-mentioned IC chip, the bare chip IC by which packaging is not carried out, IC which packaging is carried out and has a terminal in a rear face are known. Moreover, as the above IC structures, COB (Chip On Board) and MCM (Multi Chip Module) of the structure which carried one piece or two or more IC chips in one substrate, COF (Chip On FPC: chip ON flexible printed circuit substrate) of structure which carried IC chip in FPC (Flexible Printed Circuit) are known.

[0004] There is a method of performing conductive connection using the bump as an approach of connecting the above-mentioned IC chip conductively to a member for adhesion called a wiring substrate etc., after forming a bump in the input/output terminal of IC chip. In this approach, they are mutually joined by those anisotropy electric conduction adhesives in the condition of having made anisotropy electric conduction adhesives called ACF (Anisotropic Conductive Film: anisotropy electric conduction film) etc. intervening between IC chip and the member for adhesion. And the bump of IC chip flows with the electrode terminal on the member for adhesion by work of the electric conduction particle contained in anisotropy electric conduction adhesives at this time.

[0005]

[Problem(s) to be Solved by the Invention] however, field 52a which adheres to anisotropy electric conduction adhesives with the conventional IC chip among two or more bumps' 52 front faces formed as an input/output terminal on active side 51a of the IC chip 51 as shown, for example in drawing 10 -- surface 51a of the IC chip 51, and abbreviation -- it was formed as a parallel flat side.

[0006] Generally, in case the IC chip 51 is joined to the member for adhesion with anisotropy electric conduction adhesives, where anisotropy electric conduction adhesives are inserted in between, the IC chip 51 is pushed against the member for adhesion. In this way, the pushed anisotropy electric conduction adhesives move so that it may spread in a longitudinal direction. At this time, there was a possibility that the number of electric conduction particles with which it exists in breadth, consequently the place of bump side 52a may decrease so that, as for the anisotropy electric conduction adhesives pressed by bump side 52a as it is [ as opposed to / as mentioned above / surface 51a of the IC chip 51 ] an parallel flat side, a bump's 52 field 52a may escape from a bump 52, and electric conduction might

become inadequate.  
[0007]

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**TECHNICAL FIELD**

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PRIOR ART

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[Description of the Prior Art] Liquid crystal equipment is widely used as current, a portable telephone, a video camera, and other visible image displays of various kinds of electronic equipment. Moreover, various kinds of semiconductor devices are equipped in such electronic equipment or liquid crystal equipment. This semiconductor device is things, such as the IC chip itself and IC structure with which IC chip and the substrate are united.

[0003] As the above-mentioned IC chip, the bare chip IC by which packaging is not carried out, IC which packaging is carried out and has a terminal in a rear face are known. Moreover, as the above IC structures, COB (Chip On Board) and MCM (Multi Chip Module) of the structure which carried one piece or two or more IC chips in one substrate, COF (Chip On FPC: chip ON flexible printed circuit substrate) of structure which carried IC chip in FPC (Flexible Printed Circuit) are known.

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EFFECT OF THE INVENTION

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[Effect of the Invention] according to IC chip concerning this invention, IC structure, liquid crystal equipment, and electronic equipment -- the height of a bump's lateral part -- among those, since it forms more highly than the height for a flank, when anisotropy electric conduction adhesives are pressed with this IC chip, it can prevent that the electric conduction particle contained in those anisotropy electric conduction adhesives moves to the outside of IC chip by the bump lateral part with high height. Consequently, many electric conduction particles can be suspended for a bump's place, and, therefore, a positive flow can be secured.

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TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] however, field 52a which adheres to anisotropy electric conduction adhesives with the conventional IC chip among two or more bumps' 52 front faces formed as an input/output terminal on active side 51a of the IC chip 51 as shown, for example in drawing 10 -- surface 51a of the IC chip 51, and abbreviation -- it was formed as a parallel flat side.

[0006] Generally, in case the IC chip 51 is joined to the member for adhesion with anisotropy electric conduction adhesives, where anisotropy electric conduction adhesives are inserted in between, the IC chip 51 is pushed against the member for adhesion. In this way, the pushed anisotropy electric conduction adhesives move so that it may spread in a longitudinal direction. At this time, there was a possibility that the number of electric conduction particles with which it exists in breadth, consequently the place of bump side 52a may decrease so that, as for the anisotropy electric conduction adhesives pressed by bump side 52a as it is [ as opposed to / as mentioned above / surface 51a of the IC chip 51 ] an parallel flat side, a bump's 52 field 52a may escape from a bump 52, and electric conduction might become inadequate.

[0007] This invention is accomplished in view of the above-mentioned trouble, prevents that the electric conduction particle contained in anisotropy electric conduction adhesives escapes from the bump side of IC chip when pasting up IC chip equipped with two or more bumps on the member for adhesion with anisotropy electric conduction adhesives, and aims at making it make the electric conduction particle of more numbers exist in a bump side.

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**MEANS**

[Means for Solving the Problem] (1) In order to attain the above-mentioned purpose, IC chip concerning this invention In IC chip with which the field which was equipped with two or more bumps who expose outside while building in the semi-conductor, and was equipped with those bumps is stuck to the member for adhesion by pressure by anisotropy electric conduction adhesives Said member for adhesion of said bump and the front face of the component side which counters are characterized by Sayori Taka of the direction of the inside having the high height of the direction of an outside of the IC chip concerned.

[0009] According to this IC chip, since the height of a bump's lateral part is high compared with the height of an inside part, when anisotropy electric conduction adhesives are pressed with this IC chip, it can prevent that the electric conduction particle contained in those anisotropy electric conduction adhesives moves to the outside of IC chip by the bump lateral part with high height. Consequently, many electric conduction particles can be suspended for a bump's place, and, therefore, a positive flow can be secured.

[0010] In addition, "anisotropy electric conduction adhesives" is electric conduction adhesives which contain an electric conduction particle in the interior, and it is not limited to a specific thing about the concrete quality of the material. For example, ACF (Anisotropic Conductive Film: anisotropy electric conduction film) in which the whole is formed in the shape of a film, the anisotropy electric conduction adhesives with which the whole is formed in the shape of a paste can be considered.

[0011] Moreover, "the member for adhesion" is a member of the arbitration which IC chip pastes up, for example, it can consider various kinds of members, such as a hard wiring substrate, an elastic wiring substrate, a flexible wiring substrate, and a transparence substrate of a liquid crystal panel.

[0012] (2) In the above-mentioned IC chip, when setting the height of a bump's lateral part to H and setting the height of the bump's inside part to h, as for the difference dimension (H-h) of height, it is desirable that it is smaller than the path of the electric conduction particle contained in anisotropy electric conduction adhesives. If it carries out like this, more electric conduction particles are securable for a bump's place.

[0013] (3) In each above-mentioned IC chip, a bump can form so that it may have a crevice in said member for adhesion, and the component side which counters. If it carries out like this, since an electric conduction particle is storable in the crevice, much more many electric conduction particles are securable with a bump's place.

[0014] (4) Next, in IC structure in which IC structure concerning this invention has IC chip and the substrate which the IC chip pastes using anisotropy electric conduction adhesives, it is characterized by constituting said IC chip with IC chip indicated to above-mentioned (1) - (3). According to this IC structure, like the explanation indicated to above-mentioned (1) - (3) in relation to IC chip, many electric conduction particles can be suspended for a bump's place, and, therefore, a positive flow can be secured.

[0015] (5) Next, in the liquid-crystal equipment with which the liquid crystal equipment concerning this invention has a liquid crystal panel including the structure which sandwiched liquid crystal with the

substrate of a pair, and IC for a liquid crystal drive connected to the liquid crystal panel directly or indirectly using anisotropy electric conduction adhesives, it is characterized by to constitute the IC for a liquid crystal drive with IC chip indicated to above-mentioned (1) - (3). With this liquid crystal equipment as well as the explanation indicated to above-mentioned (1) - (3) in relation to IC chip, many electric conduction particles can be suspended for a bump's place, and, therefore, a positive flow can be secured.

[0016] In addition, after pasting up IC for a liquid crystal drive on middle substrates for example, other than a liquid crystal panel, by pasting up the middle substrate on a liquid crystal panel, I hear that connecting IC for a liquid crystal drive to a liquid crystal panel indirectly finally connects IC for a liquid crystal drive to a liquid crystal panel, and there is.

[0017] (6) Next, the electronic equipment concerning this invention is characterized by constituting the IC chip with IC chip given [ above-mentioned ] in (1) - (3) in the electronic equipment constituted including IC chip. By this electronic equipment as well as the explanation indicated to above-mentioned (1) - (3) in relation to IC chip, many electric conduction particles can be suspended for a bump's place, and, therefore, a positive flow can be secured.

[0018]

[Embodiment of the Invention] Drawing 1 shows 1 operation gestalt of IC chip concerning this invention. The IC chip 1 shown here carries out the internal organs of the circuit constituted so that a predetermined function might be done so, and is formed as an IC for a liquid crystal drive for liquid crystal equipment etc. Two or more bumps 2 who act as the input terminal or output terminal of an internal-organs circuit are formed in active side 1a of this IC chip 1.

[0019] As shown in drawing 2, the IC chip 1 forms the aluminum electrode 3 in the proper place of the front face of body of chip 1b, it forms a passivation membrane 4 in other parts so that the aluminum electrode 3 may serve as opening, and forms a bump 2 by carrying out patterning of the gold plate of a bump configuration on the aluminum electrode 3 further. In addition, in drawing 1 and drawing 2, in order to show the structure of bump 2 grade intelligibly, a bump's 2 dimension to the IC chip 1 is drawn more greatly than a dressed size.

[0020] In addition, the bump array of IC chip is not restricted to the array of drawing 1, and may be prepared in two sides of IC chip, and staggered arrangement is sufficient as it.

[0021] Drawing 3 shows the IC structure 6 of the COB (Chip On Board) method which is an example of the usage of the above-mentioned IC chip 1. This IC structure 6 is formed by using ACF (Anisotropic Conductive Film) 8 as anisotropy electric conduction adhesives for IC wearing field A set as the predetermined location on the printed circuit board 7 as a member for adhesion, and pasting up the IC chip 1. In drawing 3, the passive circuit elements 9, such as a chip resistor and a chip capacitor, are arranged around the IC chip 1 if needed.

[0022] In case the thing whose adhesives which constitute ACF8 are resin of a heat-curing mold, then the IC chip 1 are now pasted up on a printed circuit board 7, adhesion is attained by heating and pressing ACF8, where ACF8 is inserted between the IC chip 1 and a printed circuit board 7. If adhesion is attained, as shown in drawing 4, the bump 2 of the IC chip 1 will flow by work of the electric conduction particle 11 contained in ACF8 in the electrode terminals 8a and 8b of a printed circuit board 7.

[0023] With this operation gestalt, as shown in drawing 4, height H of a bump's 2 lateral part is higher than height h of an inside part. For this reason, if ACF8 is pressed to a printed circuit board 7 with the IC chip 1, while being washed away by the resin of many adhesives which constitute ACF8 on the outside of the IC chip 1, migration of the electric conduction particle 11 which is going to move to both the outsides of the IC chip 1 is prevented by the wall section 17 of a lateral part with a bump's 2 high height, and prevents an outflow. Therefore, a good flow is securable by making the electric conduction particle 11 of a large number contained in ACF capture and intervene between a bump 2 and Electrodes 8a and 8b.

[0024] In addition, as for the height variation of tolerance (H-h) between a bump's 2 lateral part, and an inside part, it is desirable to set up smaller than the path of the electric conduction particle 11 contained

in ACF8. It is because larger spacing than the path of the electric conduction particle 11 will be formed between a bump 2 and Electrodes 8a and 8b if variation of tolerance (H-h) is larger than the path of the electric conduction particle 11, so there is a possibility that capture of the electric conduction particle 11 by the bump 2 may become inadequate.

[0025] Drawing 5 shows a bump's 2 deformation implementation gestalt. About the bump 2 who showed here, it adheres to ACF8 and a crevice 5 is formed in the field which faces the electrodes 8a and 8b of a bump's 2 member for adhesion. While prevention of an outflow is made by work of this crevice 5 in the wall section 17 of a lateral part with a bump's 2 high height, many electric conduction particles 11 are made by are recording and reservation by the hollow 15 of a crevice in a bump's 2 place, and, so, a good flow can be secured.

[0026] Drawing 6 shows other deformation implementation gestalten about a bump 2. About the bump 2 who showed here, it adheres to ACF8 and the field which faces the electrodes 8a and 8b of a bump's 2 member for adhesion is formed outside at the curve configuration used as a convex. Since many electric conduction particles 11 are reserved by the inside part with a bump's 2 low height, a good flow is securable with work of the taper section 18 of these heights.

[0027] Drawing 7 shows the liquid crystal equipment which is other examples of the structure using the IC chip 1 shown in drawing 1. The liquid crystal equipment 12 shown here has the translucency substrates 13a and 13b of the pair which counters mutually. The sealant 14 was printed by one side of these substrates 13a and 13b in the shape of [ rectangle-like ] a frame, and Substrates 13a and 13b have pasted up by the sealant 3. Moreover, liquid crystal is enclosed into the gap formed among those substrates 13a and 13b, and the so-called cel gap. Moreover, translucency electrode 16a of the shape of two or more straight line is formed in the inside front face of one substrate 13a of photolithography processing. And translucency electrode 16b of the shape of two or more straight line is formed in the inside front face of substrate 13b of another side of photolithography processing.

[0028] Of the above, the liquid crystal panel of the structure which sandwiched liquid crystal with the substrates 13a and 13b of a pair is formed. In this liquid crystal panel, one substrate 13a is jugged out to the outside of substrate 13b of another side, and IC wearing field A for equipping that overhang section with IC21 for a liquid crystal drive as an IC chip is formed.

[0029] Translucency electrode 16a formed in substrate 13a is directly prolonged to the overhang section of substrate 13a, and the tip serves as a land in IC wearing field A. Moreover, translucency electrode 16b formed in substrate 13b is connected to electric conduction Rhine of the overhang section of substrate 13a through the flow material (not shown) arranged between substrate 13b and substrate 13a. And the tip of those electric conduction Rhine serves as a land in IC mounting field A. With this operation gestalt, the overhang section of translucency substrate 13a is equivalent to the member for adhesion for pasting up IC21 for a liquid crystal drive, i.e., IC chip.

[0030] After equipping IC mounting field A with IC21 for a liquid crystal drive, a polarizing plate 12 is stuck on the outside front face of the translucency substrates 13a and 13b, and a back light is further attached to one outside of the translucency substrates 13a and 13b if needed. IC21 for a liquid crystal drive is a semiconductor device which has the function to send out a scan signal and a data signal to the translucency electrodes 16a and 16b, a signal is delivered and received to the active side 21a (bottom side of drawing) between external circuits, or two or more bumps 2 for receiving supply of an electrical potential difference from an external power are formed in it. As these bumps 2 also showed drawing 4, height H of a lateral part is higher than height h of an inside part. Therefore, when heating and pressurizing ACF8 by IC21 for a liquid crystal drive, it can prevent that the electric conduction particle contained in the ACF8 escapes to a bump's 2 outside, and, so, many electric conduction particles can be captured between a bump 2 and the land in IC wearing field A.

[0031] Drawing 8 shows an example of the portable telephone which is 1 operation gestalt of the electronic equipment constituted including IC chip concerning this invention. The portable telephone shown here is constituted including the upper case 26 and the bottom case 27. The antenna 28 for transmission and reception, the keyboard unit 29, and a microphone 32 are formed in the upper case 26. And the liquid crystal equipment 12 shown in drawing 7, a loudspeaker 33, and the circuit board 34 are

formed in the bottom case 27.

[0032] On the circuit board 34, as shown in drawing 9, the power supply section 39 which supplies power to the receive section 38 connected to the input terminal of a loudspeaker 33, the dispatch section 37 connected to the output terminal of a microphone 32, the control section 36 constituted including CPU, and each part is formed. A control section 36 reads the condition of the dispatch section 37 and a receive section 38, supplies information to IC21 for a liquid crystal drive based on the result, and displays visible information on the effective viewing area of liquid crystal equipment 12. Moreover, a control section 36 supplies information to IC21 for a liquid crystal drive based on the information outputted from the keyboard unit 29, and displays visible information on the effective viewing area of liquid crystal equipment 12.

[0033] as mentioned above, although the desirable operation gestalt was mentioned and this invention was explained, this invention is not limited to the operation gestalt, within the limits of invention indicated to the claim, is boiled variously and can be changed.

[0034] For example, IC chip concerning this invention is not restricted to the configuration shown in drawing 1, but can be constituted in the configuration of other arbitration. Moreover, IC structure concerning this invention is not restricted to the semiconductor device of the COB type shown in drawing 3, but a COF (Chip On FPC: chip ON flexible printed circuit substrate) type may be used, and is not restricted to the liquid crystal equipment further shown in drawing 7, but can make IC chip equipped with the bump the structure of other arbitration of the format pasted up using anisotropy electric conduction adhesives. Moreover, the liquid crystal equipment concerning this invention is not restricted to the liquid crystal equipment of a COG method as shows IC for a liquid crystal drive to drawing 7 of the format directly carried on a liquid crystal panel substrate, but can be used as other liquid crystal equipments of various kinds of. Moreover, although the portable telephone was mentioned as an example of electronic equipment in drawing 8, of course, this invention is applicable to the electronic equipment of video camera and others various kinds.

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1] It is the perspective view showing 1 operation gestalt of IC chip concerning this invention.

[Drawing 2] It is the sectional view of IC chip of drawing 1 .

[Drawing 3] It is the perspective view showing 1 operation gestalt of IC structure concerning this invention.

[Drawing 4] It is the sectional view expanding and showing the important section of IC structure of drawing 3 .

[Drawing 5] It is the sectional view showing a bump's modification.

[Drawing 6] It is the sectional view showing other modifications of a bump.

[Drawing 7] It is the perspective view showing 1 operation gestalt of the liquid crystal equipment concerning this invention.

[Drawing 8] It is the perspective view decomposing and showing 1 operation gestalt of the electronic equipment concerning this invention.

[Drawing 9] It is the block diagram showing an example of the electric control system used for the electronic equipment of drawing 8 .

[Drawing 10] It is the front view showing an example of the conventional IC chip.

[Description of Notations]

1 IC Chip

1a Active side

1b The body of IC chip

2 Bump

3 Aluminum Electrode

4 Passivation Membrane

6 IC Structure

7 Printed Circuit Board (Member for Adhesion)

8 ACF (Anisotropy Adhesives)

9 Passive Circuit Elements

11 Electric Conduction Particle

12 Liquid Crystal Equipment

13a, 13b Translucency substrate

14 Sealant

15 Hollow

16a, 16b Translucency electrode

17 Wall Section

18 Taper Section

21 IC for Liquid Crystal Drive (IC Chip)

A IC wearing field

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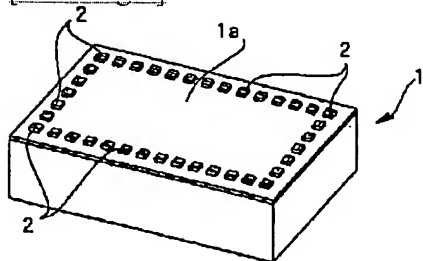
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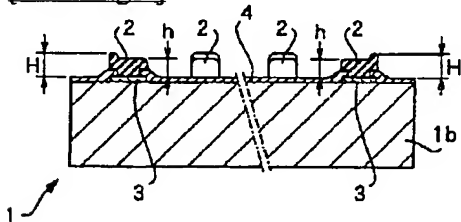
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## DRAWINGS

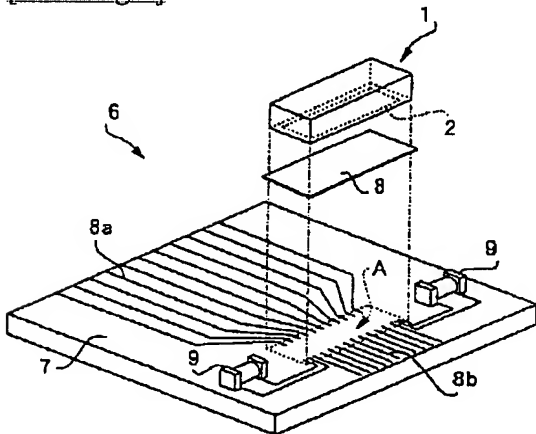
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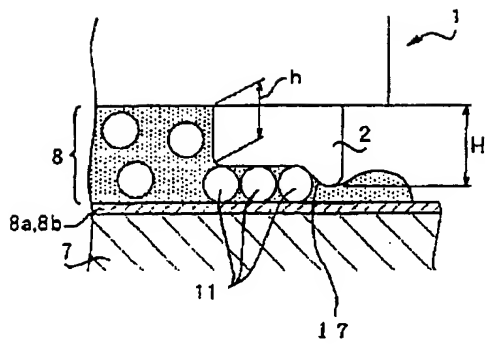
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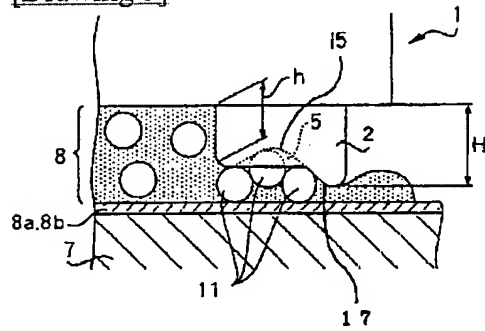
[Drawing 3]



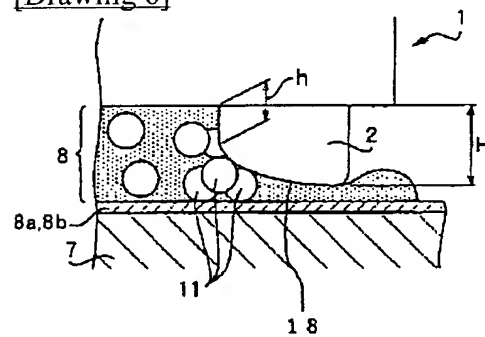
[Drawing 4]



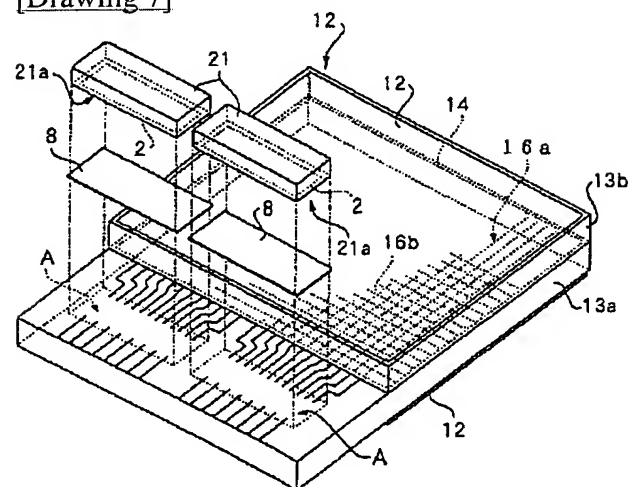
[Drawing 5]



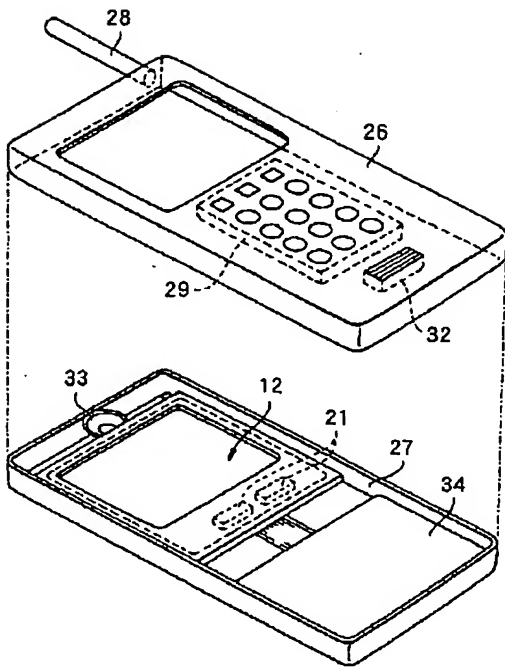
[Drawing 6]



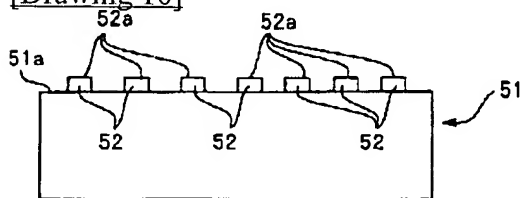
[Drawing 7]



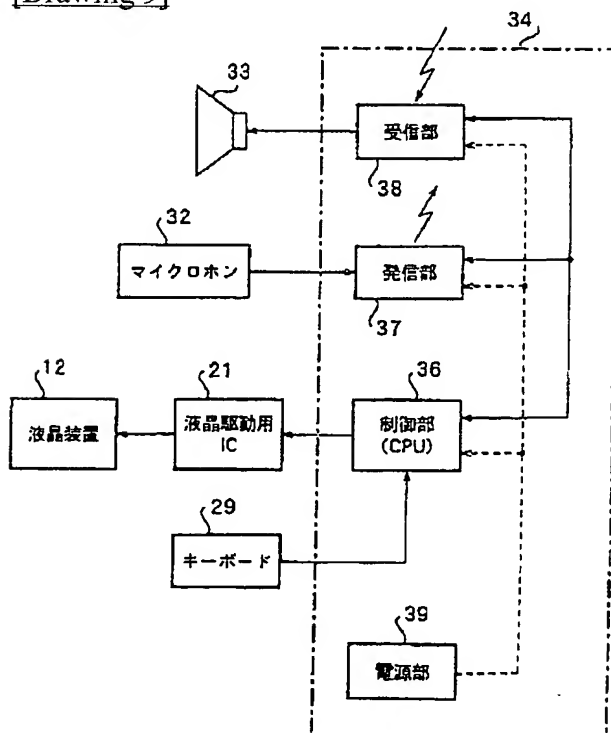
[Drawing 8]



[Drawing 10]



[Drawing 9]



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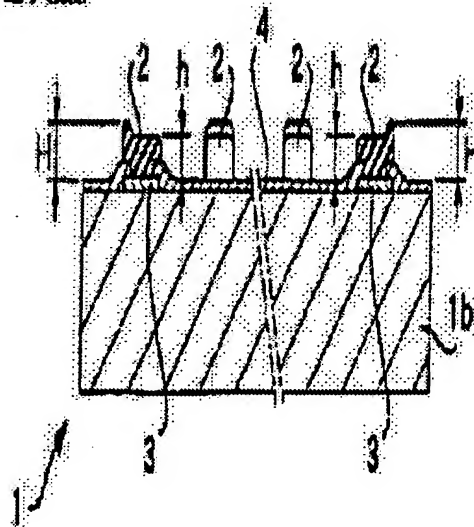
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(54)【発明の名称】 ICチップ、IC構造体、液晶装置及び電子機器

(57)【要約】

【課題】 複数のパンプを備えたICチップをACFによって基板等に接合するときに、ACFに含まれる導電粒子がICチップのパンプ面から逃げることを防止して、より多くの個数の導電粒子をパンプ面に存在させるようにする。

【解決手段】 半導体を内蔵すると共に外部に露出する複数のパンプ2を備え、それらのパンプ2を備えた面がACFによって基板等に接合されるICチップ1である。複数のパンプ2の少なくとも一つについては外側部分の高さHが内側部分の高さhよりも高く設定される。ICチップ1でACFを加圧するとき、ACFの内部に含まれる導電粒子がパンプ2の外側へ逃げることを高さの高い外側部分によって阻止して、より多くの導電粒子をパンプ2の所に捕獲する。



【特許請求の範囲】

【請求項 1】 半導体を内蔵すると共に外部に露出する複数のパンプを備え、それらのパンプを備えた面が異方性導電接合剤によって接合対象部材に圧着される IC チップにおいて、

前記パンプの前記接合対象部材と対向する実装面の表面は、当該 IC チップの外側方向の高さが内側方向の高さよりも高いことを特徴とする IC チップ。

【請求項 2】 請求項 1 記載の IC チップにおいて、前記パンプの外側部分の高さを H とし、そのパンプの内側部分の高さを h とするとき、高さの差  $(H-h)$  は前記異方性導電接合剤に含まれる導電粒子の径よりも小さいことを特徴とする IC チップ。

【請求項 3】 請求項 1 又は請求項 2 記載の IC チップにおいて、前記パンプは前記接合対象部材と対向する実装面に凹部を有することを特徴とする IC チップ。

【請求項 4】 IC チップと、異方性導電接合剤を用いてその IC チップが接合される基板とを有する IC 構造体において、前記 IC チップは請求項 1 から請求項 3 のうちの少なくともいずれか一つに記載の IC チップによって構成されることを特徴とする IC 構造体。

【請求項 5】 一対の基板によって液晶を挟んだ構造を含む液晶パネルと、異方性導電接合剤を用いてその液晶パネルに直接又は間接に接続される液晶駆動用 IC とを有する液晶装置において、その液晶駆動用 IC は請求項 1 から請求項 3 のうちの少なくともいずれか一つに記載の IC チップによって構成されることを特徴とする液晶装置。

【請求項 6】 IC チップを含んで構成される電子機器において、その IC チップは請求項 1 から請求項 3 のうちの少なくともいずれか一つに記載の IC チップによって構成されることを特徴とする電子機器。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、複数のパンプによって入出力端子を形成する構造の IC チップに関する。また本発明は、その IC チップを含んで構成される IC 構造体に関する。また本発明は、その IC チップを含んで構成される液晶装置に関する。また本発明は、その IC チップを含んで構成される電子機器に関する。

【0002】

【従来の技術】 現在、携帯電話機、ビデオカメラ、その他各種の電子機器の可視像表示部として液晶装置が広く用いられている。また、そのような電子機器や液晶装置の中には各種の半導体装置が装填されている。この半導体装置というのは、IC チップそのものや、IC チップと基板とが一体化している IC 構造体等のことである。

【0003】 上記 IC チップとしては、パッケージングされていないベアチップ IC や、パッケージングされて

いて表面に端子を持つ IC 等が知られている。また、上記のような IC 構造体としては、1 個又は複数個の IC チップを 1 つの基板に搭載した構造の COB (Chip On Board) 及び MCM (Multi-Chip Module) や、FPC (Flexible Printed Circuit) に IC チップを搭載した構造の COF (Chip On FPC: チップ オン フレキシブルプリント回路基板) 等が知られている。

【0004】 上記 IC チップを配線基板等といった接合対象部材に導電接続する方法として、IC チップの入出力端子にパンプを形成した上でそのパンプを利用して導電接続を行う方法がある。この方法では、ACF (Anisotropic Conductive Film: 異方性導電膜) 等といった異方性導電接合剤を IC チップと接合対象部材との間に介在させた状態でそれらがその異方性導電接合剤によって互いに接合される。そしてこのとき、IC チップのパンプは異方性導電接合剤に含まれる導電粒子の働きによって接合対象部材上の電極端子と導通する。

【0005】

【発明が解決しようとする課題】 しかしながら従来の IC チップでは、例えば図 10 に示すように、IC チップ 51 の能動面 51a 上に入出力端子として形成される複数のパンプ 52 の表面のうち、異方性導電接合剤が付着される面 52a が IC チップ 51 の表面 51a と略平行な平坦面として形成されていた。

【0006】 一般に、IC チップ 51 を異方性導電接合剤によって接合対象部材に接合する際には、異方性導電接合剤を間に挟んだ状態で IC チップ 51 を接合対象部材に押し付ける。こうして押し付けられた異方性導電接合剤は横方向に広がるように移動する。このとき、パンプ 52 の面 52a が上記のように IC チップ 51 の表面 51a に対して平行な平坦面であると、パンプ面 52a によって押圧される異方性導電接合剤はパンプ 52 から逃げるように広がり、その結果、パンプ面 52a の所に存在する導電粒子の数が少なくなって導電が不十分になるおそれがあった。

【0007】 本発明は、上記の問題点に鑑みて成されたものである。複数のパンプを備えた IC チップを異方性導電接合剤によって接合対象部材に接合するときに、異方性導電接合剤に含まれる導電粒子が IC チップのパンプ面から逃げることを防止して、より多くの個数の導電粒子をパンプ面に存在させるようにすることを目的とする。

【0008】

【課題を解決するための手段】 (1) 上記の目的を達成するため、本発明に係る IC チップは、半導体を内蔵すると共に外部に露出する複数のパンプを備え、それらのパンプを備えた面が異方性導電接合剤によって接合対象部材に圧着される IC チップにおいて、前記パンプの前記接合対象部材と対向する実装面の表面は、当該 IC チップの外側方向の高さが内側方向の高さよりも高いこ

とを特徴とする。

【0009】このICチップによれば、パンプの外側部分の高さが内側部分の高さに比べて高くなっているため、このICチップによって異方性導電接合剤を押圧したとき、その異方性導電接合剤に含まれる導電粒子がICチップの外側へ移動することを高さの高いパンプ外側部分によって阻止できる。その結果、パンプの所多数の導電粒子を保管でき、よって、確実な導通を確保できる。

【0010】なお、「異方性導電接合剤」というのは、その内部に導電粒子を含む導電接合剤のことであり、具体的な材質に関しては特定のものに限定されない。例えば、全体がフィルム状に形成されるACF（Anisotropic Conductive Film：異方性導電膜）や、全体がペースト状に形成される異方性導電接合剤等が考えられる。

【0011】また、「接合対象部材」というのは、ICチップが接合される任意の部材のことであり、例えば、硬質の配線基板、軟質の配線基板、可換性の配線基板、液晶パネルの透明基板等といった各種の部材が考えられる。

【0012】（2）上記のICチップにおいて、パンプの外側部分の高さをHとし、そのパンプの内側部分の高さをhとすると、高さの差寸法（H-h）は異方性導電接合剤に含まれる導電粒子の径よりも小さいことが望ましい。こうすれば、より多くの導電粒子をパンプの所に確保できる。

【0013】（3）上記の各ICチップにおいて、パンプは前記接合対象部材と対向する実装面に凹部を有するように形成できる。こうすれば、その凹部の中に導電粒子を格納できるのでパンプの所により一層多くの導電粒子を確保できる。

【0014】（4）次に、本発明に係るIC構造体は、ICチップと、異方性導電接合剤を用いてそのICチップが接合される基板とを有するIC構造体において、前記ICチップは上記（1）～（3）に記載したICチップによって構成されることを特徴とする。このIC構造体によれば、ICチップに関連して上記（1）～（3）に記載した説明と同様にして、パンプの所多数の導電粒子を保管でき、よって、確実な導通を確保できる。

【0015】（5）次に、本発明に係る液晶装置は、一対の基板によって液晶を挟んだ構造を含む液晶パネルと、異方性導電接合剤を用いてその液晶パネルに直接又は間接に接続される液晶駆動用ICとを有する液晶装置において、その液晶駆動用ICは上記（1）～（3）に記載したICチップによって構成されることを特徴とする。この液晶装置によっても、ICチップに関連して上記（1）～（3）に記載した説明と同様にして、パンプの所多数の導電粒子を保管でき、よって、確実な導通を確保できる。

【0016】なお、液晶駆動用ICを液晶パネルに間接に接続するというのは、例えば、液晶パネル以外の中間基板に液晶駆動用ICを接合した後、その中間基板を液晶パネルに接合することによって、間接的に液晶駆動用ICを液晶パネルに接続するということである。

【0017】（6）次に、本発明に係る電子機器は、ICチップを含んで構成される電子機器において、そのICチップが上記（1）～（3）に記載のICチップによって構成されることを特徴とする。この電子機器によっても、ICチップに関連して上記（1）～（3）に記載した説明と同様にして、パンプの所多数の導電粒子を保管でき、よって、確実な導通を確保できる。

【0018】

【発明の実施の形態】図1は、本発明に係るICチップの一実施形態を示している。ここに示したICチップ1は、所定の機能を奏するように構成された回路を内蔵するものであり、例えば、液晶装置のための液晶駆動用IC等として形成される。このICチップ1の駆動面1aには、内蔵回路の入力端子又は出力端子として作用する複数のパンプ2が設けられる。

【0019】ICチップ1は、例えば図2に示すように、チップ本体1bの表面の適所にアルミ電極3を形成し、そのアルミ電極3が開口となるようにその他の部分にパシベーション膜4を形成し、さらにアルミ電極3の上にパンプ形状の金メッキをバターニングすることによりパンプ2を形成する。なお、図1及び図2では、パンプ2等の構造を分かり易く示すために、ICチップ1に対するパンプ2の寸法を実際の寸法よりも大きく描いている。

【0020】なお、ICチップのパンプ配列は図1の配列に限られるものではなく、ICチップの2辺に設けられていてもよく、また、千鳥配列でもよい。

【0021】図3は、上記ICチップ1の利用方法の一例である。COB（Chip On Board）方式のIC構造体5を示している。このIC構造体5は、接合対象部材としてのプリント基板7上の所定位置に設定されたIC接合領域Aに異方性導電接合剤としてのACF（Anisotropic Conductive Film）8を用いてICチップ1を接合することによって形成される。図3において、ICチップ1の周辺には、必要に応じて、チップ抵抗やチップコンデンサ等といった回路部品9が配置される。

【0022】今、ACF8を構成する接合剤が熱硬化型の樹脂であるものとすれば、ICチップ1をプリント基板7に接合する際には、ACF8をICチップ1とプリント基板7との間に挟んだ状態でACF8を加熱及び押圧することにより、接合が達成される。接合が達成されると、図4に示すように、ACF8に含まれる導電粒子11の働きにより、ICチップ1のパンプ2がプリント基板7の電極端子8a及び8bに導通する。

【0023】本実施形態では、図4に示すように、パンプ

プ2の外側部分の高さHが内側部分の高さhよりも高くなっている。このため、ICチップ1によってACF8をプリント基板7へ押圧すると、ACF8を構成する多くの接着剤の樹脂がICチップ1の外側へ押し流されるときに、ICチップ1の外側へ共に移動しようとする導電粒子11の移動はパンプ2の高さの高い外側部分の内壁部17によって阻止され、流出を防止する。そのため、パンプ2と電極8a、8bとの間にACFに含まれる多数の導電粒子11を捕獲し、介在させることで良好な導通を確保することができる。

【0024】なお、パンプ2の外側部分と内側部分との間の高さ寸法差(H-h)はACF8に含まれる導電粒子11の径よりも小さく設定するのが望ましい。寸法差(H-h)が導電粒子11の径よりも大きいと、パンプ2と電極8a、8bとの間に導電粒子11の径よりも大きい間隙が形成されてしまうので、パンプ2による導電粒子11の捕獲が不十分になるおそれがあるからである。

【0025】図5は、パンプ2の実形実施形態を示している。ここに示したパンプ2に関しては、ACF8が付着され、パンプ2の接着対象部材の電極8a、8bに向き合う面に凹部5が形成される。この凹部5の働きにより、パンプ2の高さの高い外側部分の内壁部17で流出の防止がなされると共に、凹部の深み15により多数の導電粒子11をパンプ2の所に蓄積及び確保ができ、それ故、良好な導通を確保できる。

【0026】図6は、パンプ2についての他の実形実施形態を示している。ここに示したパンプ2に関しては、ACF8が付着され、パンプ2の接着対象部材の電極8a、8bに向き合う面が外側へ凸となる湾曲形状に形成されている。この凸部のテーパ部18の働きにより、パンプ2の高さの低い内側部分に多くの導電粒子11が確保されるための良好な導通を確保できる。

【0027】図7は、図1に示すICチップ1を利用した構造体の他の一例である液晶装置を示している。ここに示す液晶装置12は、互いに対向する一対の透光性基板13a及び13bを有する。これらの基板13a及び13bの一方にはシール材14が長方形の枠状に印刷され、そのシール材14によって基板13a及び13bが接着されている。また、それらの基板13a及び13bの間に形成された間隙、いわゆるセルギャップの中に液晶が封入される。また、一方の基板13aの内側表面には複数個の直線状の透光性電極15aがフォトリソグラフィ処理によって形成される。そして、他方の基板13bの内側表面には複数個の直線状の透光性電極15bがフォトリソグラフィ処理によって形成される。

【0028】以上により、一対の基板13a及び13bによって液晶を挟んだ構造の液晶パネルが形成される。この液晶パネルにおいて、一方の基板13aは他方の基板13bの外側へ張り出しており、その張り出し部にIC

チップとしての液晶駆動用IC21を装着するためのIC装着領域Aが設けられる。

【0029】基板13aに形成された透光性電極15aは基板13aの張り出し部へ直接に延び、そしてその先端がIC装着領域A内においてランドとなっている。また、基板13bに形成された透光性電極15bは基板13bと基板13aの間に配設された導通材(図示せず)を介して基板13aの張り出し部の導電ラインに接続する。そしてそれらの導電ラインの先端がIC装着領域A内においてランドとなっている。本実施形態では、透光性基板13aの張り出し部が、液晶駆動用IC21すなわちICチップを装着するための接着対象部材に相当する。

【0030】IC装着領域Aに液晶駆動用IC21を装着した後、透光性基板13a及び13bの外側表面に偏光板12が貼着され、さらに必要に応じて透光性基板13a及び13bのいずれか一方の外側にバックライトが付設される。液晶駆動用IC21は、透光性電極15a及び15bに走査信号及びデータ信号を送り出す機能を有する半導体装置であり、その駆動部21a(図の下側面)には外部回路との間で信号の授受をしたり、外部電源から電圧の供給を受けるための複数のパンプ2が設けられる。これらのパンプ2も図4に示したように、外側部分の高さHが内側部分の高さhよりも高くなっている。そのため、液晶駆動用IC21によってACF8を加熱及び加圧するとき、そのACF8の中に含まれる導電粒子がパンプ2の外側へ逃げることが防止でき、それ故、パンプ2とIC装着領域A内のランドとの間に多数の導電粒子を捕獲できる。

【0031】図8は、本発明に係るICチップを含んで構成される電子機器の一実施形態である携帯電話機の一例を示している。ここに示す携帯電話機は、上ケース26及び下ケース27を含んで構成される。上ケース26には、送受信用のアンテナ28と、キーボードユニット29と、そしてマイクロホン32とが設けられる。そして、下ケース27には、例えば図7に示した液晶装置12と、スピーカ33と、そして回路基板34とが設けられる。

【0032】回路基板34の上には、図9に示すように、スピーカ33の入力端子に接続された受信部36と、マイクロホン32の出力端子に接続された発信部37と、CPUを含んで構成された制御部36と、そして各部へ電力を供給する電源部39とが設けられる。制御部36は、発信部37及び受信部38の状態を読み取ってその結果に基づいて液晶駆動用IC21に情報を供給して液晶装置12の有効表示領域に可視情報を表示する。また、制御部36は、キーボードユニット29から出力される情報に基づいて液晶駆動用IC21に情報を供給して液晶装置12の有効表示領域に可視情報を表示する。



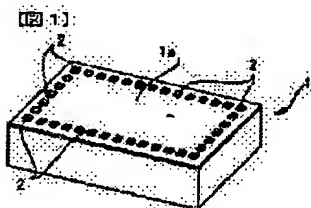
【0033】以上、好ましい実施形態を挙げて本発明を説明したが、本発明はその実施形態に限定されるものでなく、請求の範囲に記載した発明の範囲内で種々に改変できる。

【0034】例えば、本発明に係るICチップは、図1に示した形状に限られず他の任意の形状に構成できる。また、本発明に係るIC構造体は、図3に示すCOBタイプの半導体装置に限られずCOF（Chip On FPC：チップ オン フレキシブルプリント回路基板）タイプでも良く、更に図7に示す液晶装置に限られず、パンプを備えたICチップを異方性導電接合剤を用いて接合する形式の他の任意の構造体とすることができる。また、本発明に係る液晶装置は、液晶駆動用ICを液晶パネル基板の上に直接に搭載する形式の図7に示すようなCOG方式の液晶装置に限られず、他の各種の液晶装置とすることができる。また、図8では電子機器の一例として携帯電話機を挙げたが、ビデオカメラその他各種の電子機器に対して本発明を適用できることはもちろんである。

【0035】**【発明の効果】**本発明に係るICチップ、IC構造体、液晶装置及び電子機器によれば、パンプの外側部分の高さをその内側部分の高さよりも高く形成するので、このICチップによって異方性導電接合剤を押圧したとき、その異方性導電接合剤にきまれる導電粒子がICチップの外側へ移動することを高さの高いパンプ外側部分によって阻止できる。その結果、パンプの所に多数の導電粒子を保留でき、よって、確実な導通を確保できる。

#### 【図面の簡単な説明】

- 【図1】本発明に係るICチップの一例の実施形態を示す斜視図である。  
 【図2】図1のICチップの断面図である。  
 【図3】本発明に係るIC構造体の一例の実施形態を示す斜視図である。



【図4】図3のIC構造体の異部を拡大して示す断面図である。

【図5】パンプの変形例を示す断面図である。

【図6】パンプの他の変形例を示す断面図である。

【図7】本発明に係る液晶装置の一例の実施形態を示す斜視図である。

【図8】本発明に係る電子機器の一例の実施形態を分解して示す斜視図である。

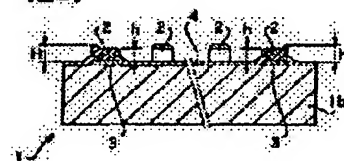
【図9】図8の電子機器に用いられる電気制御系の一例を示すブロック図である。

【図10】従来のICチップの一例を示す正面図である。

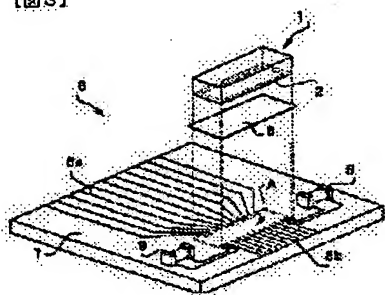
#### 【符号の説明】

- |          |                |
|----------|----------------|
| 1        | ICチップ          |
| 1a       | 駆動面            |
| 1b       | ICチップ本体        |
| 2        | パンプ            |
| 3        | アルミ電極          |
| 4        | パンベーション膜       |
| 5        | IC構造体          |
| 6        | プリント基板（接合対象部材） |
| 7        | ACF（異方性導電剤）    |
| 8        | 回路部品           |
| 9        | 導電粒子           |
| 10       | 液晶装置           |
| 11       | 透光性基板          |
| 12       | シール材           |
| 13a, 13b | 導光性電極          |
| 14       | 内装部            |
| 15       | デコーダ部          |
| 16a, 16b | 液晶駆動用IC（ICチップ） |
| 17       | IC装着領域         |
| 18       |                |
| 21       |                |
| A        |                |

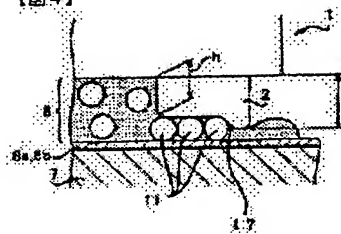
【図2】



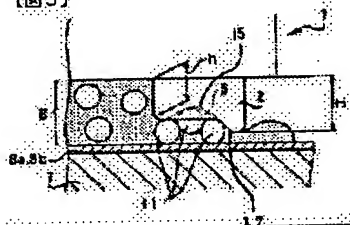
【図3】



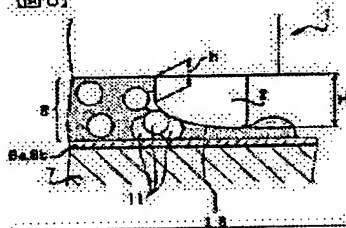
【図4】



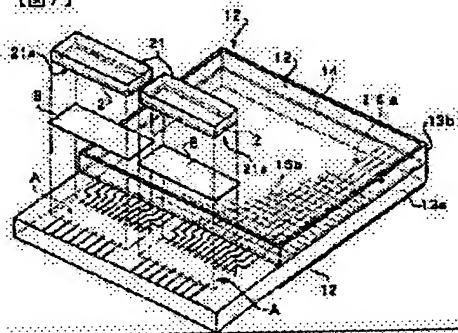
【図5】



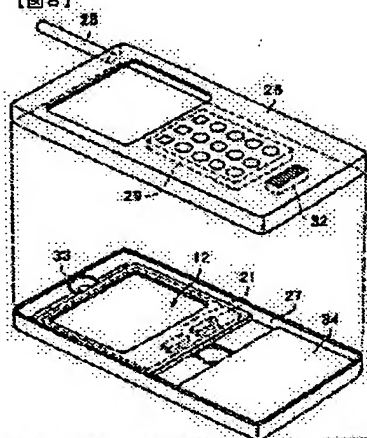
【図6】



【図7】



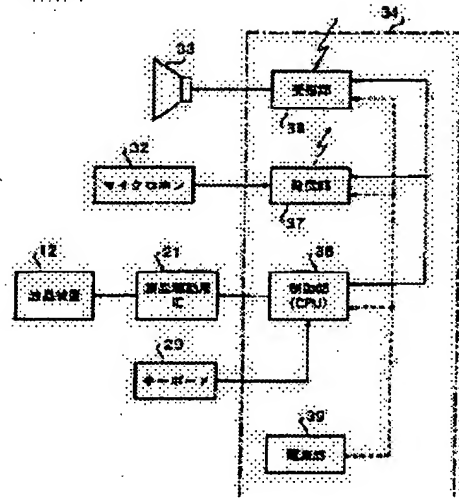
【図8】



【図10】



【図9】



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